

Listing of Claims:

1. (currently amended) A control apparatus, comprising:

a controller;

a detecting device for providing analog signals in response to pressures applied to the controller during normal operation of the controller and an analog calibration signal in response to ~~an~~ a predetermined initial calibrating pressure applied to the controller; and

an output unit including a level segmenting unit for segmenting an output level of the analog calibration signal into predetermined calibration levels based on the predetermined initial calibrating pressure and for segmenting an output level of the analog signals into predetermined levels during normal operation, and an analog-to-digital (A/D) converting unit for converting the predetermined levels into digital signals each having a plurality of bits.

2. (previously presented) An apparatus according to Claim 1, wherein said detecting device is a pressure-sensitive device which is arranged at a position relative to said controller such that a pressure acting on said controller is transmitted to said detecting device.

3. (previously presented) An apparatus according to Claim 1, wherein said detecting device comprises:

a resistor; and

a conductive member which moves together with said controller for contacting said resistor; and

wherein said conductive member has elasticity, and the output level of the analog signal corresponds to a contact area between said resistor and said conductive member.

4. (previously presented) An apparatus according to Claim 1, wherein said detecting device includes:

a conductive member; and

a resistor which moves together with said controller for contacting said conductive member;

wherein said conductive member has elasticity, and the output level of the analog signal corresponds to a contact area between said resistor and said conductive member.

5. (previously presented) An apparatus according to Claim 3 or 4, wherein said conductive member is deformable and a size of the contact area is a function of a contact pressure exerted on said conductive member by said resistor.

6. (original) An apparatus according to Claim 5, wherein said conductive member is formed with a shape having a peaked longitudinal-section surface.

7. (original) An apparatus according to Claim 5, wherein said conductive member is formed with a shape having a trapezoidal longitudinal-section surface.

8. (currently amended) An apparatus according to Claim 5, wherein said conductive member is formed with a shape having a cross-sectional area which decreases in discrete steps stepwise toward a portion which faces said resistor.

9. (original) An apparatus according to Claim 5, wherein said conductive member is formed with a spherical surface which faces said resistor.

10. (original) An apparatus according to Claim 3 or 4, wherein said resistor is formed with a shape having a cross-sectional area which decreases toward a top portion which faces said conductive member.

11. (original) An apparatus according to Claim 10, wherein said resistor is formed with a shape having a peaked longitudinal-section surface.

12. (original) An apparatus according to Claim 10, wherein said resistor is formed with a shape having a trapezoidal longitudinal-section surface.

13. (original) An apparatus according to Claim 10, wherein said resistor is formed with a spherical surface which faces said conductive member.

14. (currently amended) An apparatus according to Claim 3 or 4, wherein said resistor is formed with a shape having a cross-sectional area which decreases in discrete steps stepwise toward a portion which faces said conductive member.

15. (currently amended) An apparatus according to Claim 3 or 4, wherein said conductive member is deformable in accordance with a contact pressure exerted on said conductive member by said resistor such that a size of the contact area between said conductive member and said resistor changes; and said resistor comprises non-conductive regions such that the contact area increases in discrete steps stepwise.

16. (cancelled)

17. (previously presented) An apparatus according to Claim 1, wherein said level segmenting unit uniformly segments the output level of the analog signal.

18. (currently amended) A control apparatus, comprising:

a controller;
a detecting device which provides analog signals in response to pressures applied to said controller during normal operation of the controller and an analog calibration signal in response to a predetermined initial calibrating pressure applied to the controller, said detecting device including a resistor and a conductive member which move together with said controller for contacting said resistor, where said conductive member has elasticity, and an output level of the analog signal corresponds to a contact area between said resistor and said conductive member;

a level segmenting unit for segmenting the output level of the analog calibration signal into predetermined calibration levels based on the predetermined initial calibrating pressure and for segmenting an output level of the analog signals into predetermined levels during normal operation; and

an analog-to-digital (A/D) converting unit for converting the predetermined levels into digital signals each having a plurality of bits.

19. (currently amended) A control apparatus, having a controller and a detecting device which provides analog signals in response to pressures applied to said controller, wherein said control apparatus further comprises an output unit comprising:

a controller;
a detecting device which provides analogs signal in response to pressures applied to said controller during normal

operation of the controller and an analog calibration signal in response to a predetermined initial calibrating pressure applied to the controller, said detecting device including a conductive member and a resistor which moves together with said controller for contacting said conductive member, where said conductive member has elasticity, and an output level of the analog signal corresponds to a contact area between said resistor and said conductive member;

a level segmenting unit for segmenting the output level of the analog calibration signal into predetermined calibration levels based on the predetermined initial calibrating pressure and for segmenting an output level of the analog signals into predetermined levels during normal operation; and

an A/D converting unit for converting the predetermined levels into digital signals each having a plurality of bits.

20. (previously presented) A control apparatus according to Claim 18 or 19, wherein said conductive member is deformable and a size of the contact area is a function of a contact pressure exerted on said conductive member by said resistor.

21. (original) A device according to Claim 20, wherein said conductive member is formed with a shape having a peaked longitudinal-section surface.

22. (original) A device according to Claim 20, wherein said conductive member is formed with a shape having a trapezoidal longitudinal-section surface.

23. (currently amended) A device according to Claim 20, wherein said conductive member is formed with a shape having a cross-

sectional area which decreases in discrete stepsstepwise towards a portion that faces said resistor.

24. (original) A device according to Claim 20, wherein said conductive member is formed with a shape having a spherical surface which faces said resistor.

25. (original) A device according to Claim 18 or 19, wherein said resistor is formed with a shape having a cross-sectional area which decreases towards a lop portion that faces said conductive member.

26. (original) A device according to Claim 25, wherein said resistor is formed with a shape having a peaked longitudinal-section surface.

27. (original) A device according to Claim 25, wherein said resistor is formed with a shape having a trapezoidal longitudinal-section surface.

28. (original) A device according to Claim 25, wherein said resistor is formed with a shape having a spherical surface which faces said conductive member.

29. (currently amended) A device according to Claim 18 or 19, wherein said resistor is formed with a shape having a cross-sectional area which decreases in discrete stepsstepwise towards a portion that faces said conductive member.

30. (currently amended) A device according to Claim 18 or 19, wherein said conductive member is deformable in accordance with a contact pressure exerted on said conductive member by said

resistor such that a size of the contact area between said conductive member and said resistor changes; and said resistor comprises non-conductive regions such that the contact area increases in discrete stepsstepwise.

31. (currently amended) A control apparatus, comprising:

a controller;
a detecting device for providing analog signals in response to pressures applied to said controller during normal operation of the controller and an analog calibration signal in response to a predetermined an-initial calibrating pressure applied to the controller; and

an output unit for segmenting an output level of the analog calibration signal into predetermined calibration levels based on the predetermined initial calibrating pressure and for segmenting an output level of the analog signals into predetermined levels during normal operation and for converting the predetermined levels into digital signals each having a plurality of bits;

wherein said detecting device has a conductive member and a resistor, and a contact area between said conductive member and said resistor increases in discrete stepsstepwise with an increase in said pressure applied to said controller, and the output level of the analog signal corresponds to the contact area between said resistor and said conductive member.

32. (previously presented) An apparatus according to claim 31, wherein said conductive member moves together with said controller for contacting said resistor such that the output level of the analog signal corresponds to the contact area between said resistor and said conductive member, and said conductive member has elasticity.

33. (previously presented) An apparatus according to claim 31, wherein said resistor moves together with said controller for contacting said conductive member such that the output level of the analog signal corresponds to the contact area between said resistor and said conductive member, and said conductive member has elasticity.

34. (currently amended) An apparatus according to claims 32 or 33, wherein said conductive member is formed with a shape having a cross-sectional area which decreases in discrete stepsstepwise toward a portion which faces said resistor.

35. (currently amended) An apparatus according to claims 32 or 33, wherein said resistor is formed with a shape having a cross-sectional area which decreases in discrete stepsstepwise toward a portion which faces said conductive member.

36. (currently amended) An apparatus according to claims 32 or 33, wherein said conductive member is deformable in accordance with a contact pressure exerted on said conductive member by said resistor such that a size of the contact area changes; and said resistor comprises non-conductive regions such that the contact area increases in discrete stepsstepwise.

37. (currently amended) A device for use in a control apparatus having a controller which provides analog signals in response to pressures applied to said controller during normal operation of the controller and an analog calibration signal in response to a predetermined an-initial calibrating pressure applied to the controller, said device comprising:

an output unit for segmenting an output level of the analog calibrating signal into predetermined calibration levels based on the predetermined initial calibrating pressure and for | segmenting an output level of the analog signals into predetermined levels during normal operation and for converting the predetermined levels into digital signals each having a plurality of bits;

a conductive member; and

a resistor;

wherein a contact area between said conductive member and said resistor increases in discrete steps stepwise with an | increase in the pressure applied to said controller, and the output level of the analog signal corresponds to the contact area between said resistor and said conductive member.

38. (previously presented) An apparatus according to claim 37, wherein said conductive member moves together with said controller for contacting said resistor such that the output level of the analog signal corresponds to the contact area between said resistor and said conductive member, and said conductive member has elasticity.

39. (previously presented) An apparatus according to claim 37, wherein said resistor moves together with said controller for contacting said conductive member such that the output level of the analog signal corresponds to the contact area between said resistor and said conductive member, and said conductive member has elasticity.

40. (currently amended) An apparatus according to claims 38 or 39, wherein said conductive member is formed with a shape having

a cross-sectional area which decreases in discrete stepsstepwise toward a portion which faces said resistor.

41. (currently amended) An apparatus according to claims 38 or 39, wherein said resistor is formed with a shape having a cross-sectional area which decreases in discrete stepsstepwise toward a portion which faces said conductive member.

42. (currently amended) An apparatus according to claims 38 or 39, wherein said conductive member is deformable in accordance with a contact pressure exerted on said conductive member by said resistor such that a size of the contact area changes; and said resistor comprises non-conductive regions such that the contact area increases in discrete stepsstepwise.

43. (currently amended) A method of generating a signal representative of a pressure applied to a control apparatus, comprising:

(a) generating analog signals representative of pressures applied to the control apparatus during normal operation of the control apparatus;

(b) generating an analog calibration signal in response to a predetermined an-initial calibrating pressure applied to the control apparatus;

(c) segmenting the output level of the analog calibration signal into predetermined calibration levels based on the predetermined initial calibrating pressure;

(d) segmenting an output level of the analog signals into predetermined levels during normal operation; and

(e) assigning preset digital signals corresponding to each of the analog output levels.

44. (currently amended) A method of generating a signal representative of pressures applied to a control apparatus comprising a controller including a resistor and an elastic conductive member which moves together with the controller for contacting the resistor, comprising:

(a) generating analog signals corresponding to a contact area between the resistor and the conductive member during normal operation of the controller;

(b) generating an analog calibration signal in response to a predetermined an initial calibrating pressure applied to the control apparatus;

(c) segmenting the output level of the analog calibration signal into predetermined calibration levels based on the predetermined initial calibrating pressure;

(d) segmenting an output level of the analog signals into predetermined levels during normal operation; and

(e) assigning preset digital signals corresponding to each of the analog output levels.

45. (currently amended) The method as claimed in claim 44, wherein the resistor increases in discrete steps~~stepwise~~ with an increase in said pressure applied to said controller.

46. (previously presented) An apparatus according to Claim 1, wherein the output unit calibrates the control apparatus by ascertaining a maximum output level from the detecting device based on a maximum applied pressure such that the level segmenting unit divides the predetermined levels equally up to the maximum output level.

47. (previously presented) An apparatus according to Claim 18 or 19, wherein the level segmenting unit calibrates the control

apparatus by ascertaining a maximum output level from the detecting device based on a maximum applied pressure and dividing the predetermined levels equally up to the maximum output level.

48. (previously presented) An apparatus according to Claim 31 or 37, wherein the output unit calibrates the controller by ascertaining a maximum output level from the detecting device based on a maximum applied pressure such that the output unit divides the predetermined levels equally up to the maximum output level.

49. (previously presented) The method as claimed in claims 43 or 44, further comprising calibrating the control apparatus by ascertaining a maximum output level of the analog calibration signal based on a maximum applied pressure and dividing the predetermined levels equally up to the maximum output level.

50. (currently amended) A control apparatus, comprising:

a controller;

a detecting device for providing an analog signal in response to a predetermined ~~an~~ initial calibrating pressure applied to the controller; and

an output unit including a level segmenting unit for segmenting an output level of the analog signal into predetermined calibration levels based on the predetermined initial calibrating pressure, and an analog-to-digital (A/D) converting unit for converting the predetermined calibration levels into digital signals each having a plurality of bits.

51. (previously presented) An apparatus according to Claim 50, wherein said detecting device is a pressure-sensitive device

which is arranged at a position relative to said controller such that a pressure acting on said controller is transmitted to said detecting device.

52. (previously presented) An apparatus according to Claim 50, wherein said detecting device comprises:

a resistor; and

a conductive member which moves together with said controller for contacting said resistor; and

wherein said conductive member has elasticity, and the output level of the analog signal corresponds to a contact area between said resistor and said conductive member.

53. (previously presented) An apparatus according to Claim 50, wherein said detecting device includes:

a conductive member; and

a resistor which moves together with said controller for contacting said conductive member;

wherein said conductive member has elasticity, and the output level of the analog signal corresponds to a contact area between said resistor and said conductive member.

54. (previously presented) An apparatus according to Claim 52 or 53, wherein said conductive member is deformable and a size of the contact area is a function of a contact pressure exerted on said conductive member by said resistor.

55. (previously presented) An apparatus according to Claim 54, wherein said conductive member is formed with a shape having a peaked longitudinal-section surface.

56. (previously presented) An apparatus according to Claim 54, wherein said conductive member is formed with a shape having a trapezoidal longitudinal-section surface.

57. (currently amended) An apparatus according to Claim 54, wherein said conductive member is formed with a shape having a cross-sectional area which decreases in discrete steps~~stepwise~~ toward a portion which faces said resistor.

58. (previously presented) An apparatus according to Claim 54, wherein said conductive member is formed with a spherical surface which faces said resistor.

59. (previously presented) An apparatus according to Claim 52 or 53, wherein said resistor is formed with a shape having a cross-sectional area which decreases toward a top portion which faces said conductive member.

60. (previously presented) An apparatus according to Claim 59, wherein said resistor is formed with a shape having a peaked longitudinal-section surface.

61. (previously presented) An apparatus according to Claim 59, wherein said resistor is formed with a shape having a trapezoidal longitudinal-section surface.

62. (previously presented) An apparatus according to Claim 59, wherein said resistor is formed with a spherical surface which faces said conductive member.

63. (currently amended) An apparatus according to Claim 52 or 53, wherein said resistor is formed with a shape having a cross-

sectional area which decreases in discrete stepsstepwise toward a portion which faces said conductive member.

64. (currently amended) An apparatus according to Claim 52 or 53, wherein said conductive member is deformable in accordance with a contact pressure exerted on said conductive member by said resistor such that a size of the contact area between said conductive member and said resistor changes; and said resistor comprises non-conductive regions such that the contact area increases in discrete stepsstepwise.

65. (previously presented) An apparatus according to Claim 50, wherein said level segmenting unit uniformly segments the output level of the analog signal.

66. (currently amended) A control apparatus, comprising:

a controller;
a detecting device which provides an analog signal in response to a predetermined an-initial calibrating pressure applied to said controller, said detecting device including a resistor and a conductive member which moves together with said controller for contacting said resistor, where said conductive member has elasticity, and an output level of the analog signal corresponds to a contact area between said resistor and said conductive member;

a level segmenting unit for segmenting the output level of the analog signal into predetermined calibration levels based on the predetermined initial calibrating pressure; and

an analog-to-digital (A/D) converting unit for converting the predetermined calibration levels into digital signals each having a plurality of bits.

67. (currently amended) A control apparatus, having a controller and a detecting device which provides an analog signal in response to a pressure applied to said controller, wherein said control apparatus further comprises an output unit comprising:

a controller;

a detecting device which provides an analog signal in response to a predetermined initial calibrating pressure applied to said controller, said detecting device including a conductive member and a resistor which moves together with said controller for contacting said conductive member, where said conductive member has elasticity, and an output level of the analog signal corresponds to a contact area between said resistor and said conductive member;

a level segmenting unit for segmenting the output level of the analog signal into predetermined calibration levels based on the predetermined initial calibrating pressure; and

an A/D converting unit for converting the predetermined calibration levels into digital signals each having a plurality of bits.

68. (previously presented) A control apparatus according to Claim 66 or 67, wherein said conductive member is deformable and a size of the contact area is a function of a contact pressure exerted on said conductive member by said resistor.

69. (previously presented) A device according to Claim 68, wherein said conductive member is formed with a shape having a peaked longitudinal-section surface.

70. (previously presented) A device according to Claim 68, wherein said conductive member is formed with a shape having a trapezoidal longitudinal-section surface.

71. (currently amended) A device according to Claim 68, wherein said conductive member is formed with a shape having a cross-sectional area which decreases in discrete stepsstepwise towards a portion that faces said resistor.

72. (previously presented) A device according to Claim 68 wherein said conductive member is formed with a shape having a spherical surface which faces said resistor.

73. (currently amended) A device according to Claim 66 or 67, wherein said resistor is formed with a shape having a cross-sectional area which decreases towards a top-top portion that faces said conductive member.

74. (previously presented) A device according to Claim 73, wherein said resistor is formed with a shape having a peaked longitudinal-section surface.

75. (previously presented) A device according to Claim 73, wherein said resistor is formed with a shape having a trapezoidal longitudinal-section surface.

76. (previously presented) A device according to Claim 73, wherein said resistor is formed with a shape having a spherical surface which faces said conductive member.

77. (currently amended) A device according to Claim 66 or 67, wherein said resistor is formed with a shape having a cross-sectional area which decreases in discrete stepsstepwise towards a portion that faces said conductive member.

78. (currently amended) A device according to Claim 66 or 67 wherein said conductive member is deformable in accordance with a contact pressure exerted on said conductive member by said resistor such that a size of the contact area between said conductive member and said resistor changes; and said resistor comprises non-conductive regions such that the contact area increases in discrete steps stepwise.

79. (currently amended) A control apparatus, comprising:

a controller;
a detecting device for providing an analog signal in response to a predetermined ~~an~~ initial calibrating pressure applied to said controller; and

an output unit for segmenting an output level of the analog signal and for converting the segmented output level of the analog signal into a predetermined calibration levels based on the predetermined initial calibration pressure and for converting the predetermined calibration levels into digital signals each having a plurality of bits;

wherein said detecting device has a conductive member and a resistor, and a contact area between said conductive member and said resistor increases stepwise ~~in~~ discrete steps with an increase in said pressure applied to said controller, and the output level of the analog signal corresponds to the contact area between said resistor and said conductive member.

80. (previously presented) An apparatus according to claim 79, wherein said conductive member moves together with said controller for contacting said resistor such that the output level of the analog signal corresponds to the contact area between said resistor and said conductive member, and said conductive member has elasticity.

81. (previously presented) An apparatus according to claim 79, wherein said resistor moves together with said controller for contacting said conductive member such that the output level of the analog signal corresponds to the contact area between said resistor and said conductive member, and said conductive member has elasticity.

82. (currently amended) An apparatus according to claims 80 or 81, wherein said conductive member is formed with a shape having a cross-sectional area which decreases stepwise in discrete steps toward a portion which faces said resistor.

83. (currently amended) An apparatus according to claims 80 or 81, wherein said resistor is formed with a shape having a cross-sectional area which decreases stepwise in discrete steps toward a portion which faces said conductive member.

84. (currently amended) An apparatus according to claims 80 or 81, wherein said conductive member is deformable in accordance with a contact pressure exerted on said conductive member by said resistor such that a size of the contact area changes; and said resistor comprises non-conductive regions such that the contact area increases stepwise in discrete steps.

85. (currently amended) A device for use in a control apparatus having a controller which provides an analog signal in response to a predetermined ~~an~~ initial calibrating pressure applied to said controller, said device comprising:

an output unit for segmenting an output level of the analog signal into predetermined calibration levels based on ~~the~~a predetermined initial calibration pressure and for converting the predetermined calibration levels into digital signals each having a plurality of bits;

a conductive member; and

a resistor;

wherein a contact area between said conductive member and said resistor increases stepwisein discrete steps with an increase in the pressure applied to said controller, and the output level of the analog signal corresponds to the contact area between said resistor and said conductive member.

86. (previously presented) An apparatus according to claim 85, wherein said conductive member moves together with said controller for contacting said resistor such that the output level of the analog signal corresponds to the contact area between said resistor and said conductive member, and said conductive member has elasticity.

87. (previously presented) An apparatus according to claim 85, wherein said resistor moves together with said controller for contacting said conductive member such that the output level of the analog signal corresponds to the contact area between said resistor and said conductive member, and said conductive member has elasticity.

88. (currently amended) An apparatus according to claims 86 or 87, wherein said conductive member is formed with a shape having a cross-sectional area which decreases stepwise in discrete steps toward a portion which faces said resistor.

89. (currently amended) An apparatus according to claims 86 or 87, wherein said resistor is formed with a shape having a cross-sectional area which decreases stepwise in discrete steps toward a portion which faces said conductive member.

90. (currently amended) An apparatus according to claims 86 or 87, wherein said conductive member is deformable in accordance with a contact pressure exerted on said conductive member by said resistor such that a size of the contact area changes; and said resistor comprises non-conductive regions such that the contact area increases stepwise in discrete steps.

91. (currently amended) A method of generating a signal representative of a pressure applied to a control apparatus, comprising:

(a) generating an analog signal representative of a predetermined initial pressure applied to the controller;

(b) segmenting the output level of the analog signal into predetermined calibration levels based on the predetermined initial calibrating pressure; and

(c) assigning preset digital signals corresponding to each of the predetermined calibration levels.

92. (currently amended) A method of generating a signal representative of a pressure applied to a control apparatus comprising a controller including a resistor and an elastic

conductive member which moves together with the controller for contacting the resistor, comprising:

(a) generating an analog signal corresponding to a contact area between the resistor and the conductive member, including generating a predetermined ~~an~~ initial calibrating pressure applied to the controller;

(b) segmenting the output level of the analog signal into predetermined calibration levels based on the predetermined initial calibration pressure; and

(c) assigning preset digital signals corresponding to each of the predetermined calibration levels.

93. (currently amended) The method as claimed in claim 92, wherein the resistor increases stepwise in discrete steps with an increase in said pressure applied to said controller.

94. (previously presented) An apparatus according to Claim 50, wherein the output unit calibrates the control apparatus by ascertaining a maximum output level from the detecting device based on a maximum applied pressure such that the level segmenting unit divides the predetermined levels equally up to the maximum output level.

95. (previously presented) An apparatus according to Claim 66 or 67, wherein the level segmenting unit calibrates the control apparatus by ascertaining a maximum output level from the detecting device based on a maximum applied pressure and dividing the predetermined levels equally up to the maximum output level.

96. (previously presented) An apparatus according to Claim 79 or 85, wherein the output unit calibrates the controller by

ascertaining a maximum output level from the detecting device based on a maximum applied pressure such that the output unit divides the predetermined levels equally up to the maximum output level.

97. (previously presented) The method as claimed in claims 91 or 92, further comprising calibrating the control apparatus by ascertaining a maximum output level of the analog calibration signal based on a maximum applied pressure and dividing the predetermined levels equally up to the maximum output level. {